REMARKS

Reconsideration and re-examination are hereby requested.

The Abstract has been amended according to the suggestion of the Examiner and to correct a typographical error.

The Examiner's comment with regard to page 4, paragraph [0012] is not understood. According to applicants records such paragraph is only one sentence long and the amendment referred to by the Examiner only changed"/" to - .

The claims have been amended to correct errors pointed out by the Examiner.

Claims 4 and 12 stand rejected under 35 USC 102 as being anticipated by Kibe (U.S. Patent No. 5,842,341). Claim 4 points out that the method includes:

> (a) detecting an exothermic reaction across the catalyst;
> (b) detecting a temperature of an output of the catalyst in response to the detected exothermic reaction; and
> (c) injecting the hydrocarbon into the reaction in accordance with the detected temperature. (emphasis added)

Thus, in accordance with claim 4 hydrocarbons are injected in accordance with a temperature detected in response to detection of an exothermic reaction. Thus, referring to FIG. 2, the exothermic reaction is detected when T_EXO exceeds T_EXO_THRES and the temperature" T_UPSTR (i.e., the temperature detected in response to the detected exotherm) is passed through gate 30, (i.e., T_LO) and such detected temperature T_UPSTR is then used in the injection of the hydrocarbons.

The temperature Tgo of Kibe is a continually monitored temperature and not a temperature detected in response to a detected exothermic reaction, as claimed.

Claim 12 points out that the method includes:

> (a) detecting an exothermic reaction across the catalyst;
> (b) measuring a temperature of an output of the catalyst in response to the detected exothermic reaction; and
> (c) injecting the hydrocarbon into the reaction in accordance with the measured temperature. (emphasis added)

Thus, referring to FIG. 2, the exothermic reaction is detected when T_EXO exceeds T_EXO_THRES and the temperature" T_UPSTR (i.e., the temperature measured in response to the detected exotherm) is passed through gate 30, (i.e., T_LO) and such measured temperature T_UPSTR is then used in the injection of the hydrocarbons.

The temperature Tgo of Kibe is a continually monitored temperature and not a temperature measured in response to a detected exothermic reaction.

Claims 4-13 stand rejected as being anticipated by Hirota et al., (U. S. Patent No. 5,201,802).

Claim 4 points out that the method includes:

> (a) detecting an exothermic reaction across the catalyst;
> (b) detecting a temperature of an output of the catalyst in response to the detected exothermic reaction; and
> (c) injecting the hydrocarbon into the reaction in accordance with the detected temperature. (emphasis added)

The Examiner states in paragraph 8 that "an outlet temperature t2 is detected and measured"; however, referring to Hirota et al., it is pointed out that t2 is not a measured or detected temperature but rather a calculated (by the control unit) temperature limit. As stated in Hirota et al:

> Then, at step 614, a lower limit T1 and an ***upper limit T2*** of an object temperature range for the catalyst 6 are calculated based on the catalyst degradation extent DR using a map of object temperature range.

Again when referring to claims 5, 6, 10 and 13 the Examiner refers to T2 as a determined exothermic condition temperature; however, as noted above, an outlet temperature T2 is not a measured or detected temperature but rather a calculated upper temperature limit. As stated in Hirota et al:

Thus, considering claim 13, for example, such claim points out that the

method includes:

(a) detecting a temperature difference across the catalyst;
(b) comparing the temperature difference with a predetermined temperature threshold; and
(c) determining a temperature at an output of the catalyst when the temperature difference is determined to exceed the threshold.

Thus, in accordance with claim 13 hydrocarbons are injected in accordance with a temperature detected in response to detection of an exothermic reaction. Thus, referring to FIG. 2, the temperature difference (i.e., T_EXO) across the catalyst is detected. This detected temperature difference (i.e., T_EXO) is compared with a predetermined temperature threshold (T_EXO_THRES, and a temperature T_UPSTR is determined when T_EXO exceeds T_EXO_THRES.

As noted above, T2 is not a temperature determined at an output of the catalyst when the temperature difference is determined to exceed the threshold. Rather, T2 is a calculated temperature limit.

In fact, on page 6 of the Office Action, line 2 the Examiner acknowledges that T2 is an upper limit i.e., the Examiner states "... and a desired upper limit catalyst output temperature T2..."

With regard to claims 7 and 9, the Examiner again refers to T2 as being an exothermic condition, see page 7, line 5. Note that T2 is not a temperature determined at an output of the catalyst when the temperature difference is determined to exceed the threshold, as pointed out in Applicant's claim 13.

Claim 1 stands rejected under 35 USC 103(a) as being unpatentable over Kibe and also as being unpatentable over Hirota et al.

Applicant first wishes to discuss three points.

1. LIGHT-OFF

The term "light-off" refers to a specific **event**. It is not a temperature range, but rather a ***specific event*** that typically occurs **once per key-on session**. The method and system according to the invention inject the hydrocarbon into the engine exhaust in accordance with detection of a light-off **event.** The **light-off *event*** can be detected because when there is a hydrocarbon-O2 reaction (i.e.,

the exotherm is generated by the reaction of HC with O2, not with NOx), such reaction is an exothermic reaction and thus heat is generated and given off. The generation of such heat may be detected by measuring the difference in temperature across the catalyst. The peak in NOx conversion efficiency temperature changes with age. However, **because the peak in NOx conversion efficiency *temperature* occurs at substantially *the same temperature as light off event,*** a determination of light-off by the system and method enables adjustment in the hydrocarbon injection level for maximum NOx reduction efficiency.

Thus, LIGHT-OFF refers to an EVENT not a temperature RANGE, as described by the Examiner.

2. The phrase "DETECTING A TEMPERATURE OF AN OUTPUT OF THE CATALYST IN RESPONSE TO THE DETECTED EXOTHERMIC REACTION "

With the present invention, the difference between T_EXO and T_EXO_THRES is used to detect a light-off EVENT. When such light-off EVENT is detected such detection serves as a gating signal to gate the temperature at the output of the catalytic converter, i.e., the temperature T_UPSTR, through gate 30 to provide the light-off temperature, T_LO. The EVENT detection process is illustrated below:

Note that the event occurs only when T_EXO exceeds T_EXO_THRES. It is also noted that when such occurs the temperature at the output of the catalytic converter, i.e., the temperature T_UPSTR, passes through gate 30 to provide the light-off ***temperature***, T_LO. Again, the provided light-off temperature is an ***actual temperature***, NOT A CALCULATED TEMPERATURE RANGE.

3. The reaction between hydrocarbon (HC) and NOx is isothermic (as distinguished from an exothermic reaction), while the reaction between HC and oxygen is exothermic.

The former reaction is what defines the "prime operating mode" of the catalyst, the latter reaction generates the exotherm, that is used in our invention to adjust the temperature over which reductant is injected. Referring to FIG. 4 of the patent application, the catalytic converter enters its prime operating mode when the NOx conversion efficiency, indicated by the curve with the squares, is greater than zero.

In the example shown in FIG. 4 this occurs at temperatures between 150 and 400 deg C. On the other hand, the burning, or oxidation, of the HC, i.e., "fraction of HC burned ", shown by the curve with the diamonds has a window from 180 degrees and above. In the example shown in FIG. 4, the light-off event thus occurs at a temperature after the catalytic converter enters its prime operating mode. Conversely, reductant is injected ***before*** the catalyst generates an exotherm.

There is thus a fundamental difference between occurrence of an exotherm and the prime operating mode of the catalyst (NOx conversion), and the former is ***not*** the onset of the latter.

Thus, the time to inject reactant is different from the light off event.

In view of the forgoing, it is respectfully submitted that the Examiner has not provided any reference which describes or suggests:

> A method for controlling hydrocarbon injection into an engine exhaust to reduce NOx, comprising:
>
> injecting the hydrocarbon into the engine exhaust in accordance with detection of a light-off event, such light-off event being detected when there is a hydrocarbon-oxygen reaction wherein an exothermic reaction is produced and detected.

as set forth in claim 1

Applicant submits that all of the claims are now in condition for allowance, which action is requested.

Any questions regarding this matter may be directed to the undersigned. In the event any additional fee is required, please charge such amount to the Patent and Trademark Office Deposit Account No. 50-0845.

Respectfully submitted,

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Date

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Attachments: Replacement Sheet
Annotated Sheet Showing Changes

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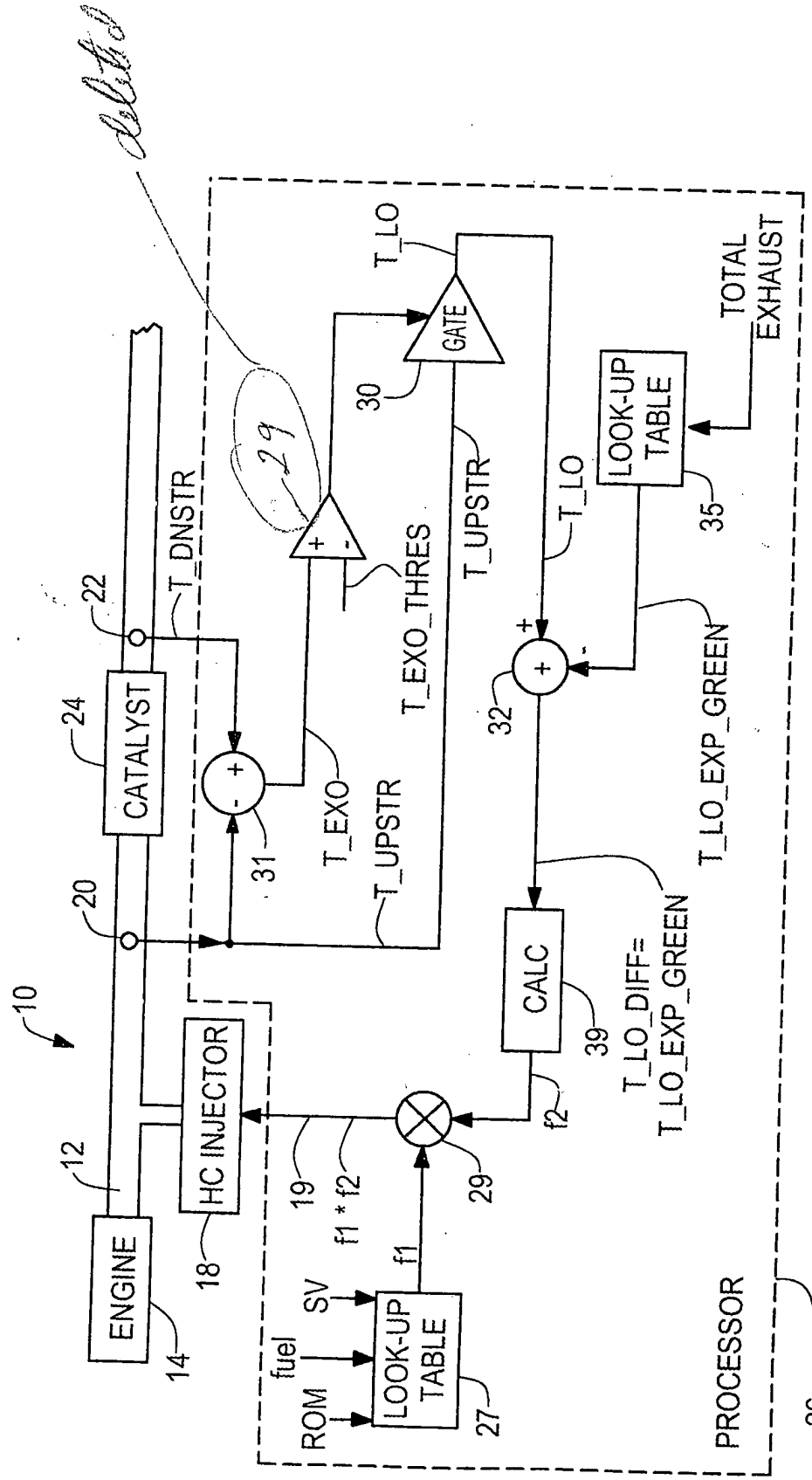

FIG. 2